

CLAIMS

1. A convexo concave amplifying device for exhibiting a convexo concave by amplifying a sense of a convexo concave of an object, comprising:

 a sensing member comprising a flexible sheet able to contact with the surface of the object and to deform along the surface of the object; and

 an exhibiting member that is formed on a surface of the flexible sheet and has a deformation resistance smaller than that of the flexible sheet in at least one of directions orthogonal to a direction of thickness of the flexible sheet.

2. A convexo concave amplifying device according to claim 1, wherein the exhibiting member comprises plural protrusions spaced each other and formed on the surface of the flexible sheet.

3. A convexo concave amplifying device according to claim 2, wherein the protrusions are plates parallel to each other.

4. A convexo concave amplifying device according to claim 2, wherein the protrusions are columns.

5. A convexo concave amplifying device according to claim 1, wherein the exhibiting member is made of foam.

6. A convexo concave amplifying device according to claim 1, wherein the exhibiting member is a sheet having plural holes extending in a direction of thickness thereof.

7. A convexo concave amplifying device according to either one of claims 1 through 6, wherein the sensing member or the exhibiting member is made of resin.

8. A convexo concave amplifying device according to either one of claims 1 through 7, wherein the exhibiting member further comprises a strain sensing tool for detecting a strain of the exhibiting member.

9. A convexo concave amplifying device according to claim 8, wherein the strain sensing tool is a strain gauge.

10. A convexo concave detecting method for detecting a convexo concave of an object, comprising

a process of using a convexo concave amplifying device comprising a sensing member comprising a flexible sheet and an exhibiting member that is formed on a surface of the flexible sheet and has a deformation resistance smaller than that of the flexible sheet in at least one of directions orthogonal to a direction of thickness of the flexible sheet, wherein the process comprises

a contacting step of contacting the sensing member with a surface of the object and deforming the flexible sheet of the sensing member along the surface of the object, and

a detecting step of detecting the convexo concave by sensing a deformation of the exhibiting member induced in the contacting step.

11. A convexo concave detecting method according to claim 10, wherein

the convexo concave amplifying device in contact with the surface of the object is slid in the contacting step, thereby an amount of the deformation of the exhibiting member is induced to depend on time, and

a variation of a time-dependent amount of the deformation of the exhibiting member is sensed by a tactile sense in the detecting step.

12. A convexo concave detecting method according to claim 10 or 11, wherein the object comprises:

a surface portion having flexibility; and

a convexo concave portion having a convexo concave covered by the surface portion, wherein

the flexible sheet is pressed onto the surface of the object and is deformed along the surface of the object in the contacting step, and the convexo concave of the convexo concave portion is detected in the detecting step.

13. A deformation sensing device for sensing a deformation thereof, comprising:

a capsule deformable by stress;

a viscous fluid contained in the capsule; and

a relative movement sensing member that is disposed inside of the capsule and senses a relative movement against the viscous fluid.

14. A deformation sensing device according to claim 13, wherein the relative movement sensing member is protruded inside from an inner face of the capsule.

15. A deformation sensing device according to claim 13 or 14, wherein the relative movement sensing member comprises a strain sensing tool.

16. A deformation sensing device according to claim 15, wherein the strain sensing tool is a strain gauge or a PVDF sensor.

17. A deformation sensing device according to claim 15 or 16, wherein

the relative movement sensing member further comprises a plate distorted by a movement of the viscous fluid, and ,

the strain sensing tool is disposed on the plate.

18. A deformation sensing device according to claim 15, wherein the plate has an elastic modulus ranging from 1000 to 4000 MPa.

19. A deformation sensing device according to either one of claims 13 through 18, wherein the viscous fluid has a kinetic viscosity ranging from 1×10^{-4} to 1×10^{-7} mm²/sec.

20. A deformation sensing device according to either one of claims 13 through 19, wherein the viscous fluid is silicone oil.

21. A deformation sensing device according to either one of claims 13 through 20, wherein the capsule is made of elastic material.

22. A deformation sensing device according to either one of claims 13 through 21, wherein

the capsule comprises a flexible sheet, and

the relative movement sensing member is disposed on the flexible sheet.

23. A deformation sensing device according to either one of claims 13 through 22, wherein the relative movement sensing member comprises an exhibiting tool that acts by sensing a relative movement against the viscous fluid.

24. A deformation sensing device according to claim 23, wherein the exhibiting tool comprises a light emitter that emits light depending on a result of sensing by the relative movement sensing member.

25. A convexo concave detecting method for detecting a convexo concave of an object, comprising

a process of using a deformation sensing device comprising a capsule containing a viscous fluid therein and deformable by stress and a relative movement sensing member that is disposed inside of the capsule and senses a relative movement against the viscous fluid, wherein

the process comprises

a step that the deformation sensing device and the object are moved relatively on a condition that the deformation sensing device is in contact with a surface of the object.

26. A convexo concave position exhibiting device, comprising:

a sensing-and-exhibiting member comprising

a sensing portion comprising plural deformation sensing devices of sensing a deformation thereof caused by a

convexo concave of an object, and

an exhibiting portion comprising plural light emitters and located opposite to the sensing portion; and

a controlling member of controlling the light emitters to emit light depending on a result of sensing by the deformation sensing devices.

27. A convexo concave position exhibiting device according to claim 26, wherein an arrangement of the plural light emitters in the exhibiting portion is same as that of the plural deformation sensing devices in the sensing portion.

28. A convexo concave position exhibiting device according to claim 27, wherein the controlling member controls that light is emitted by a light emitter having a same positional relationship as a deformation sensing device having sensed a deformation thereof caused by a convexo concave of an object.

29. A convexo concave position exhibiting device according to either one of claims 26 through 28, wherein

the sensing-and-exhibiting member has a shape of a bag able to be worn by a hand, wherein

the sensing portion is operable on a palm side of the hand, and

the exhibiting portion is operable on a back side of the hand.

30. A convexo concave position exhibiting method for exhibiting a position of a convexo concave of an object, comprising:

a relative moving step that a deformation sensing device

and the object are moved relatively on a condition that the deformation sensing device is in contact with a surface of the object;

a detecting step of detecting the convexo concave by that the deformation sensing device senses a deformation thereof caused by a convexo concave of the object; and

an exhibiting step of time-dependently exhibiting a position of the convexo concave by emitting light depending on a result of detecting in the detecting step.

31. A convexo concave position exhibiting method according to claim 30, further comprising

a judging step of judging light to be emitted or not in the exhibiting step from a degree of the convexo concave detected in the sensing step.

32. A convexo concave position exhibiting method according to claim 30 or 31, wherein the deformation sensing device in contact with the surface of the object is slid in the relative moving step.

33. A convexo concave position exhibiting method according to either one of claims 30 through 32, wherein a position of a convexo concave on a surface of the object is exhibited on the surface of the object by emitting light at the position where the convexo concave exists.